Impact of Soil test based Nutrient Management Technologies in Rice under KC Canal Command Area of Kurnool district of Andhra Pradesh

K.V.Ramanaiah[1], G.Dhanalakshmi[2], G.Rajender Reddy[3], A.Krishna Murthy[4] and M.Sudhakar[5]

Abstract

Frontline demonstrations were conducted from 2007 to 2011 in KC Canal Command of Kurnool district, Andhra Pradesh to know the usefulness and economic advantage of soil test based nutrient management technology in rice. Five villages were identified and 10 farmers in each of the selected villages were randomly chosen. At the beginning of the demonstrations a base line survey of selected farmers with respect to knowledge and adoption level of different nutrient management practices, rice production costs and productivity levels was carried out. The demonstration of nutrient management technologies covering seven nutrient management practices was conducted in the selected farmers' fields under close supervision of Krishi Vigyan Kendra for a period of five years. After five years, the impact of knowledge and adoption level of soil test based nutrient management technologies and productivity enhancement in rice were assessed. The results clearly indicate an improvement in knowledge level, adoption level among the selected farmers besides yield advantage and high net income over the existing practice of nutrient application.

Introduction

The Kurnool and Cuddapah canal and Tungabhadra low level canal command area is the most potential belt for rice cultivation in Kurnool district of Andhra Pradesh. Rice is cultivated in nearly one lakh hectares in both *Kharif* and *Rabi* seasons. In order to get higher yields, farmers resort to excess use of chemical fertilizers which badly affects both the soil and crop with nutrient toxicity and deficiency, either by over use or inadequate use leading to higher production costs, subsidies on chemical fertilizers and environmental degradation.

Five hundred and ninety two (592) frontline demonstrations were organized on "Soil Test Based Nutrient Management in Rice" in farmers' fields under irrigated domains of Kurnool district from the year 2007 to 2011, to avoid wasteful expenditure on irrational nutrient application and for rationalizing the apportionment

[1,2,4&5] Krishi Vigyan Kendra, Yagantipalle, Kurnool (dist.) AP.

[3] Zonal Project Directorate (Zone-V) TOT, Hyderabad.

of different nutrient quantities to reap maximum returns in rice from the investment on plant nutrition. This was with financial assistance of ICAR, Irrigation and Command Area Development (I & CAD) and National Bank for Agriculture and Rural Development (NABARD).

The present study was conducted to evaluate the impact of front line demonstrations on Soil Test based nutrient management in rice. Impact of the technology was assessed based on selective indices like knowledge and adoption level of farmers, crop yield and returns.

Specific Objectives

1. To know the awareness/ knowledge level of farmers on Soil test based nutrient management,
2. To study the adoption/ diffusion of cost reduction technology.

Methodology

The demonstrations were conducted during the period 2007 to 2011 in eight mandals of Kurnool district of Andhra Pradesh. The soil test based nutrient management technologies include ten practices of nutrient management in rice. At the beginning of the programme, a baseline survey in five villages was carried out with ten farmers from each village whose rice production cost towards chemical fertilisers was more than Rs.12,500/ha. The knowledge and adoption levels of various technologies were worked out using a three - point scoring pattern (Prakash Kumar, 1986 and Gopala, 1991). Complete Knowledge/adoption was given a score of 3, partial knowledge/adoption was scored as 2 and no knowledge/ no adoption was given a score of 0 (zero). Thus maximum possible score was 150. The knowledge and adoption indices were worked out by using the following formula.

$$\text{Knowledge/Adoption index (\%)} = \frac{\text{Total score obtained x100}}{\text{Maximum possible score}}$$

Based on the knowledge/ adoption index, the farmers were grouped into six categories as followed by Singhavi *et al.*(1994) viz. Complete knowledge/ adoption (100 percent), very high knowledge/adoption (80 to 99 percent),high knowledge/ adoption (60 to 79.99 percent), moderate knowledge/adoption (40 to 59.99 percent), low knowledge/adoption (20 to 39.99 percent), very low knowledge/ adoption (0.01 to 19.99 percent), no knowledge/adoption (0 percent).

The demonstration of soil test based nutrient management technology was conducted in twenty five villages among selected farmers under close technical

supervision. All the selected farmers were guided and supervised in their fertiliser management practices and the data was regularly recorded with respect to number of effective tillers/m^{-2}, grains/panicle, pest and disease incidence and yield. After five years of demonstrations, the knowledge and adoption levels of different technologies were assessed. The fertiliser management and grain yield recorded for the period of five years were tabulated. Further the constraints for low, medium adoption of technologies among the respondents were documented using pre structured interview. A simple 't' test was carried out to test the significance of difference in knowledge, adoption indices, grain yield, cost of production, gross and net income level before and after the demonstration of soil test based nutrient management technology.

Sampling procedure

Five villages viz., Dornipadu, Kondapuram, Ramachadrapuram, Bhagyanagaram and Ammireddinagar villages were identified randomly from KVK adopted villages. Fifty farmers were selected who are resorting to indiscriminate and excess application of chemical fertilisers and adopting soil test based nutrient management in rice. An interview schedule was prepared for data collection.

S.No.	Variables	Measurement method
1	Extent of Crop coverage	Secondary data
2	Knowledge level of the farmers	Interview schedule
3	Yield level for the past five years	Secondary data
4	Adoption of soil test based nutrient management practices	Interview schedule
5	Constraints	Open ended questionnaire

Results and Discussion

Knowledge Level of Soil test based Nutrient Management

The data (Table 1) reveals that the results on knowledge level among the respondents clearly indicate an improvement in knowledge level of nutrient management practices which reached a very high level of 86.47 percent after the demonstration compared to medium level (46.40 percent) prior to demonstration. Similar trends were noticed in the findings of Dayananda and Kumaresan (2010).The variation between, before and after demonstration of soil test based nutrient management on knowledge level is found statistically significant at 5 percent level .

Table 1. Impact of Demonstrations on Knowledge of Soil test based Nutrient Management Practices among Respondents

Sl.no	Particulars	Before Demonstration			After Demonstration		
		Total score	Index (%)	Category	Total score	Index (%)	Category
1	Soil testing and its importance	54	36.00	L	137	91.33	VH
2	Soil sampling procedure	58	38.67	L	139	92.67	VH
3	Knowledge about the nutrient content in chemical fertilizers	38	25.33	L	120	80.00	VH
4	Split application of fertilizers	140	93.33	VH	144	96.00	VH
5	Application of FYM	111	74.00	H	145	96.67	VH
6	Vermicomposting technique	22	14.67	VL	117	78.00	H
7	Green manuring *in situ*	102	68.00	H	134	89.33	VH
8	Use of bio-fertilisers	56	37.33	L	114	76.00	H
9	Application of neem powder with urea	77	51.33	M	124	82.67	VH
10	Soil test based fertilizer application	38	25.33	L	123	82.00	VH
	Mean	**69.6**	**46.40**	**M**	**129.7**	**86.47**	**VH**
	't' Value			**6.35***			

**Significant at 5%* *Category : VL-Very low; L-Low; M-Medium; H-High; VH-Very high*

Adoption Level of Soil test based Nutrient Management

The results obtained with respect to adoption of different nutrient management practices before and after the demonstrations among the respondents are presented in Table 2.

The adoption level of most of the nutrient management practices viz., vermicomposting technique, use of bio-fertilizers, application of urea with neem powder, soil test based fertilizer application were under very low adoption level (2.67 to 14.00 %), where as the other practices like green manuring *in situ* fell under medium category (56.00 %) and Split application of chemical fertilizers belonged to very high category (88.67 %) prior to laying of these demonstrations. The average adoption level with respect to nutrient management practices was at low level (34.29 %).

After demonstration of the technologies, the adoption level of a majority of nutrient application practices were under high to very high level (62.67 to 90.67 %). Vermi-composting technology witnessed low level of adoption (34.00 %), while medium level of adoption was observed in the usage of bio-fertilisers (56.67 %).The average adoption level of nutrient management practices was at a high level (68.10 %) indicating an improvement from low (34.29 %) to high (68.10 %) level of adoption. These results are in tune with the earlier findings of Dayananda and Kumaresan (2010).

Table 2. Impact of Demonstrations on Adoption of Soil test based Nutrient Management Practices among Respondents

Sl. No.	Practice	Before Demonstration			After Demonstration		
		Total score	Index (%)	Category	Total score	Index (%)	Category
1	Split application of Chemical fertilisers	133.00	88.67	VH	136	90.67	VH
2	Application of FYM	99.00	66.00	H	127	84.67	VH
3	Vermicomposting technique	12.00	8.00	VL	51	34.00	L
4	Green manuring *in situ*	84.00	56.00	M	109	72.67	H
5	Use of biofertilisers	7.00	4.67	VL	85	56.67	M
6	Application of urea with neem powder	21.00	14.00	VL	94	62.67	H
7	Soil test based fertilizer application	4.00	2.67	VL	113	75.33	H
Mean		**51.43**	**34.29**	**L**	**102.14**	**68.10**	**H**
't' Value				**3.62***			

Overall results on adoption level of nutrient management practices among the respondents indicated significant improvement in soil test based nutrient management technologies to high level (68.10 %) after the demonstration, compared to low level (34.29 %) before the demonstration. The soil test based nutrient management technology has been successfully proved in the fields of high phosphorus built up. Even without applying phosphatic fertilizers especially complexes, farmers obtained the same yields similar to that of applied ones, in other words, saving costs on fertilizers to the tune of Rs. 6433 per ha. (5 years mean shown in Table 3) which is almost 50% of the cost on fertilizers and also obtained an additional income of Rs.10605/ha (5 years mean shown in Table 3). Farmers of other villages have seen these demonstrations through exposure visits and one to one farmer interactions were arranged effectively.

Yield and Economics after Demonstration of Soil test based Nutrient Management

The data presented in Table 3 clearly indicates that the average grain yield was significantly higher under soil test based nutrient management (7227 Kg/ha.) than farmers' existing practice (6904 Kg/ha.).The cost of production was significantly less in demonstrations (Rs. 35763/ha) as compared to farmers' practice (Rs. 42196/ha) and net difference in cost of production was Rs.6,433 /ha due to scientific way of chemical fertilizer usage. Gross and net income were significantly higher in demonstrations (Rs. 97009 ha^{-1} and Rs. 61246 ha^{-1}, respectively) as compared to the

farmers' practice (Rs. 92837ha^{-1} and Rs. 50641ha^{-1}, respectively). Benefit-cost ratio was also significantly higher in demonstrations (1:2.75) as compared to farmers' practice (1:2.23) due to low cost of production and higher gross income. Similar trends were noticed in earlier findings of Bera *et al.* (2006) and Ramanaiah *et al* (2011).

Table 3. Mean Grain Yield of Rice in Farmers' Fields from the year 2007 to 2011

Year	Yield (Kg/ha)		Cost of production (Rs /ha)		Gross returns (Rs/ha)		Net returns (Rs /ha)		Benefit cost ratio	
	FP	Demo	FP	Demo	FP	Demo	FP	Demo	FP	Demo
2007	6782	7246	37552	33526	95006	99572	57454	66046	2.53	2.97
2008	7083	7599	41440	34255	106069	113986	64629	79731	2.56	3.33
2009	6894	7295	39800	33862	103175	108736	63375	74874	2.59	3.21
2010	6019	6236	47140	39312	72225	74828	25086	35516	1.53	1.90
2011	7741	7761	45048	37862	87710	87923	42662	50061	1.95	2.32
Mean	**6904**	**7227**	**42196**	**35763**	**92837**	**97009**	**50641**	**61246**	**2.23**	**2.75**
't' value	**3.55***		**9.53***		**3.12***		**7.98***		**6.54***	

*Significant at 5% level ; FP-Farmer's practice, Demo- Demonstrations

Conclusion

The adoption of soil test based fertiliser usage through group demonstrations in KC canal command is one of the solutions to reduce production costs and ensure better soil health for sustainable crop production. Soil test based nutrient management will not only ensure sustainable crop production but will also steer the farmers towards economic usage of fertilizers depending on their financial status and prevailing market rates of the crops. The same model can be adopted for dissemination of soil test based nutrient management technology in other rice growing areas to enhance productivity and improve soil health besides reducing cost of cultivation on chemical fertilisers.

Acknowledgments

The project was financially supported by the Indian Council of Agricultural Research, the Irrigation and Command Area Development Authority, the National Bank for Agriculture and Rural Development (NABARD) and the authors are thankful for the assistance. The Authors are thankful to Sri. P. Balaji, Secretary,

SHE&CS for constant encouragement and providing all facilities for the investigation. Authors are also thankful to Dr. M.R. Sreenivasulu, Special Officer, SHE&CS for his considered views and valuable guidance in preparing the research article.

References

Bera, R, Seal A, Bhattacharyya P, Das T.H. , Sarkar D and Kangjoo K (2006). Targeted yield concept and a framework of fertilizer recommendation in irrigated rice domain of subtropical India. J. Zhejiang Univ Sci ; vol.7 (12): 963–968.

Dayananda and Kumaresan P (2010). Impact of integrated sericultural technologies on Cocoon productivity at Farmer level. Journal of Agricultural Extension Management .Vol. XI (1):97-106.

Gopala, M. (1991). A study on adoption of recommended mulberry cultivation and silk worm rearing practices in developed and less developed areas of Kolar district. M.Sc. Thesis, University of Agricultural Sciences, Bangalore.

Prakash Kumar, R. (1986). A study on adoption of improved sericultural practices and labour utilization among big, small and tenant farmers of Ramanagara taluk, Bangalore district. M.Sc. Thesis, University of Agricultural Sciences, Bangalore, India.

Ramanaiah KV, Dhanalakshmi G., Giridhara Krishna T, P.Munirathnam P, Rajender Reddy G. (2011). Soil test crop response (STCR) based nutrient application in irrigated rice domains of Kurnool district of Andhra Pradesh. International Journal of Agricultural Sciences; Vol-I :55-61.

Singhavi,N.R., Sethurao, M.K., Madhava Rao, Y.R., Iyengar, M.N.S. and Data, R.K. (1994).Knowledge level and adoption of new sericulture technology by farmers in Hunsur taluk, Mysore district, kanataka state - an evaluation. Indian J.Seric.,Vol.33 (1):48-55.